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Method for Business Process Management System Selection

Thijs van de Westelaken
Everest, t.van.de.westelaken@everest.nl

Bas Terwee
HU University of Applied Sciences, bas.terwee@student.hu.nl

Pascal Ravesteyn
Utrecht University of Applied Sciences, pascal.ravesteijn@hu.nl

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Method for Business Process Management System Selection

Thijs van de Westelaken
Everest
Den Bosch, The Netherlands
Email: t.van.de.westelaken@everest.nl

Bas Terwee
Research Group Extended Enterprise Studies
HU University of Applied Sciences
Utrecht, The Netherlands
Email: bas.terwee@student.hu.nl

Pascal Ravesteyn
Research Group Process Innovation & Information Systems
HU University of Applied Sciences
Utrecht, The Netherlands
Email: pascal.ravesteijn@hu.nl

Abstract

In recent years business process management (BPM) and specifically information systems that support the analysis, design and execution of processes (also called business process management systems (BPMS)) are getting more attention. This has lead to an increase in research on BPM and BPMS. However the research on BPMS is mostly focused on the architecture of the system and how to implement such systems. How to select a BPM system that fits the strategy and goals of a specific organization is largely ignored. In this paper we present a BPMS selection method, which is based on research into the criteria that are important for organizations, which are going to implement a BPMS.

Keywords

BPMS, Business Process Management, Selection, ANP

INTRODUCTION

The success of a Business Process Management System (BPMS) implementation is in part depended on the process that takes place before the application is implemented: the selection of the BPM-system. While there is a large amount of research on BPM projects and BPMS implementation (Fitzgerald and Murphy, 1996; Jennings et al., 2000; Brahe and Bordbar, 2007; Ravesteyn & Versendaal, 2007; Trkman, 2009; Ravesteyn & Batenburg, 2010; Grisdale & Seymour, 2011) there is none on the selection (as far as the authors are aware). Furthermore it is amazing to see how often, in practice, information systems are selected based on the personal relationship that exist between a sales manager or CEO of the vendor and the person responsible for buying IT at the customer organization. In our opinion this negatively influences the success of the implementation and adoption of an information system. For this reason we propose that organizations use a well-defined method during the BPMS selection process. However what criteria are important when selecting a BPMS and which method(s) are there available to choose from?

As described above there are currently no known methods for BPMS selection. This is mainly due to the fact that BPMS itself is not that old. Organizations can decide to use available sets of selection criteria for other enterprise systems such as Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM). These have been available for a while and are often validated by both scientific research and in practice (Illa et al., 2000; Bernroider & Koch, 2001; Rajagopal 2002). However BPM-systems are a specific kind of information system that is used both for automating processes (like ERP and CRM) as well as integrating existing information systems (like for instance an Enterprise Service Bus (ESB)). This is reflected in the definition of BPMS: “a (suite of) software application(s) that enable the modeling, execution, technical and operational monitoring, and user representation of business processes and rules, based on integration of both existing and new information systems functionality that is orchestrated and integrated via services” (Ravesteyn & Versendaal, 2007).

We find that the selection of BPMS should be done as objectively as possible, using a sound selection method that is based on (weighted) criteria, which reflect the goals and strategy of the organization. In this paper we describe the research and development of such a method. This paper is structured as follows, in the next section we describe the research approach and process, in section 3 we describe in detail the selection criteria and categories which we use in our proposed method. In section 4 existing methods for information systems selection are discussed and in section 5 our BPMS selection method is shown. In section 6 we present the conclusions based on this research and we end the paper with limitations and discussion.

RESEARCH APPROACH AND PROCESS

As foundation to our research we have chosen the design research approach as this is often used in the development of new or innovative artefacts (Hevner et al. 2004). This method is also used to analyse and understand the behaviour of information systems (Orlikowski and Baroudi, 1991). Based on this approach we have defined the following research activities:

- Literature study in order to construct a long list of selection criteria
- Analysis and cleaning of the long list of selection criteria
- Literature study to determine existing (general) selection methods in the information systems discipline
- Interviews with experts as a first validation of the selection criteria, to add missing criteria and to define a shortlist
- Survey to validate the shortlist and to determine if there is a ranking in the found criteria

In order to create a long list of BPMS selection criteria a literature study was performed. For this both scientific sources (e.g. AIS library, ScienceDirect) and practical sources (e.g. websites of consultancy and analysts firms such as Gartner and discussion groups on LinkedIn) were used. We defined a set of search terms that were both software specific (e.g. BPMS and ERP) and topic specific (e.g. selection criteria, software selection (methods)). Based on the findings of the literature study a list of 257 criteria was constructed. To shorten the list we first categorized them based on the categorization by Indora Informatisering (2004). We used this categorization as a basis that (if needed) could be altered during the research process. This is shown in table 1. In the process of categorizing the criteria we often had to go back to the literature to determine the exact meaning of a criteria. Subsequently we checked each category for criteria that were listed more than once. Many criteria were described with different terms but have the same meaning (this was easier to determine after the categorization than before since all criteria were more clearly defined). During this process we also discovered that some criteria could not clearly be put in one category so we marked these with the goal to discuss them in the interviews with the experts. The result of these steps was that the initial list was reduced to 83 criteria.

Table 1. Categories of BPMS selection criteria (Indora Informatisering, 2004)

Categories	
1. Supplier	6. Service & Support
2. Software	7. Pricing
3. Technology	8. Implementation
4. Product Development & Release management	9. Training
5. Legal	

A second step to make the list more usable was to combine criteria into main criteria and sub criteria. For example we had several criteria that were related to the cost of the software and implementation (cost of software, cost of hardware, cost of custom coding, cost for training, costs of buying versus subscription of software), which we combined into the main criteria labelled ‘cost of software and implementation’. The five criteria mentioned are now the sub criteria. Combining criteria into main criteria with sub criteria led to a shortlist of 23 main criteria.

In parallel we also performed a literature study to determine if there are selection methods for information systems available that we can (re)use in this research, the findings of this study are described in the section *Selecting an Information System*.

To determine if the list of 23 main criteria and 83 sub criteria was complete and the categories and categorization relevant we performed interviews with subject matter experts. Five different people were interviewed both from

a supplier perspective (consultants) as end-user perspective (a person responsible for the selection and implementation at a large Dutch Insurance firm). In the interviews the list with main and sub criteria was confirmed by all experts. However there was some disagreement with the categories that were used. A majority of the experts found that 'Training' should not be a separate category but that the criteria listed there should be placed in the category 'Supplier'. The same is true for the category 'Pricing'. Furthermore the interviewees found that the category 'Product Development & Release management' should be split up into 'Release management' and 'Software development'.

To validate the constructed list of criteria and categories we developed an online survey (using Limesurvey). The survey consists of 40 questions. The first part are general questions such as age of the respondent, function/role, experience with BPM(S), and the size of the organization for which they work (number of employees). We also asked if the organization for which the respondent works uses a BPMS or if the are a vendor of developer of BPMS.

In the second part of the survey we subsequently asked for each category (using a 4 point Likert scale ranging from very unimportant to very important) whether the respondent deemed the category as important or not. Following this the criteria in the mentioned category are listed and again respondents are asked if the respective criteria are important or not (using the same scale). Also an open question for comments or feedback on the category and the included criteria is added per category.

We ended the survey by asking respondents to list the categories in order of importance by ranking them from 1 to 8.

The survey was online for three weeks and to get respondents the survey was mentioned in a newsletter to the Dutch BPM-Forum members (approximately 300 subscribers) and we posted messages in six LinkedIn groups. In total we received 26 valid (fully completed) surveys. 19 of the respondents were aged between 40 and 60 years, 6 were below 40 and 1 respondent above 60. About 70% of the respondents were active as (business) consultant at a consultancy firm while the remainder worked as business analysts or enterprise architect at an end-user firm. The majority of companies (17) had more than 500 employees.

Based on the results of the survey no changes were made to the categories. Furthermore none of the categories was found to be (very) unimportant by the respondents. The most important categories according to the respondents were 'Supplier', 'Software', and 'Implementation'.

The outcomes in relation to the criteria are more divers. Not only were 14 criteria seen as the most important for the BPMS selection process (these are described in the next section), respondents also gave a lot of feedback in regards to criteria that according to the respondents were missing. Since different respondents mention the same criteria, we determined to add these to our list of main criteria. This resulted in a final list of 39 high-level criteria (see appendix 1) that was used as the basis to our selection method.

In the next section we describe the categories and selection criteria that we use in our proposed BPMS selection method.

SELECTION CRITERIA AND CATEGORIES

As described above we there are many criteria that are important during the selection of an Enterprise System and more specifically a Business Process Management System. In the method we propose the 14 most important criteria, divided into 8 categories (see table 2 and 3), are described. Furthermore the method leaves room to add (sub) criteria to each category based on the situational context of the organization. The 14 criteria include both general criteria, which can be used in the selection of any enterprise system, as well as criteria that are specific to business process management systems.

Table 2. Categories of BPMS selection criteria

Categories	
1. Supplier	5. Service & Support
2. Software	6. Software development
3. Technology	7. Implementation
4. Release management	8. Legal

The categories are based on an extensive study we performed in which we compared different methods for selecting information systems such as for example Enterprise Resource Planning. From this study we derived many different categories that were very similar. By comparing the descriptions we were able to distill the 8 criteria in table 2.

The first category of criteria is the one related to *the supplier* of the BPM-system. This can be both the developer of the software or a reseller. The second category consists of criteria related to the *functionality* that the BPMS software offers. This is different than the *technology* category which contains criteria in relation to the technology which is used in developing the software and/or how the software functions. For some organizations this is especially important to know in relation to the principles and guidelines that are described in an Enterprise Architecture. For example some organizations want a Microsoft based software landscape and therefore prefer a BPMS that is coded in .Net instead of Java. The fourth category lists criteria on *release management*. How often are new versions of the BPMS being developed and how are they released? How fast can a supplier solve security issues? These are all important aspects related to this category. Also important to know is how service and support is organized for the BPMS application. If the application fails or there is a bug how quickly will that be solved? What is the level of knowledge of support employees? Are there partners that can offer sector specific support? These are all criteria in the *service & support* category. The *software development* category contains criteria on the capacity for software development and the influence a customer has on the development of new functionality. Furthermore it is important to know if a developer is leading or following the trends in software development. After you have selected a BPMS it will need to be implemented. For many organizations it is important to know what experience the supplier has with implementing BPMS and if they have any specific sector knowledge available. This can be determined with the help of criteria in the *implementation* category. Finally the last category is *legal*. Although you can always hope for the best, it is often better to be prepared and define criteria on legal issues that you as an organization find important to be included in the BPMS selection process.

Table 3. Criteria for BPMS selection

Category	Criteria
Supplier	Supplier References End User Training
Software	Design & Analysis functionality – process modeling Usability Flexibility
Technology	Infrastructure – operating system Technical standards
Release management	Backwards compatible
Service & Support	Support organization Competence level of support employees
Software Development	Innovation power
Implementation	Experience of the vendor and/or implementation partners
Legal	Legislation used in conflicts User license agreements

As stated above the list of criteria in table 3 is not exhaustive. Furthermore many criteria are usable in a selection process of any information system and thus not specifically aimed at BPM-systems. However some of the criteria are specifically related to BPMS selection, for instance *Design & Analysis functionality*. This criterion can be broken down into several sub criteria such as *process modeling*, *process simulation*, *process validation* and so on. These sub criteria determine such things as the type of process modeling language you can use, for example event-driven process chain (EPC) or business process modeling notation (BPMN), whether or not the BPMS offers functionality to simulate processes and analyze process designs, and if (automated) checks on conformity in relation to modeling constructs are possible. Also the criteria *Infrastructure – operating system* and *Technical standards* can be made very BPMS specific. Because a BPMS will typically also be used as an

integration layer with different information systems it is important that the BPMS is enabled to communicate via the existing infrastructure and with the (often different) application languages. Related to this it is important to know if the BPMS can function in a Service Oriented Architecture (SOA) and what the possibilities are to generate different web services (e.g. process services, data services, security services etc.).

Although the selection method described in the following paragraph is based on the 8 categories and 14 criteria that we have discussed, it is important to keep in mind that you should add (sub) criteria to this list depending on your organizations situation. Also it might very well be possible that some of the criteria mentioned are not relevant in your situation in which case you should not include them in the final selection method that you are going to use for your BPMS selection process.

SELECTING AN INFORMATION SYSTEM

Before constructing a new selection method for BPMS we performed a literature study to determine if there is a method available that can be adopted for our purpose. Based on earlier research on selection methods for enterprise systems we found 4 multi-criteria methods that were pre-dominant. These are the Analytical Hierarchy Process (AHP), Analytical Network Process (ANP), Benefits, Opportunities, Costs & Risks (BOCR), and Data Envelopment Analysis (DEA) (Lien & Chan, 2000; Liang & Li, 2008; Wei, Chien, & Wang, 2005).

The last two methods are not suitable as a foundation to our method. According to Ghapanchi et al. (2008) the DEA method is difficult to use in practice as it is based on complex mathematical algorithms one score for each application that a company has on its shortlist. The BOCR method uses multi-criteria (which can be ranked according to how important they are for an organization) to determine a ranking between information systems during a selection process (Liang and Li, 2008). The high-level criteria in this method are always the *benefits, opportunities, costs and risks* and these can be further detailed into sub criteria. As the high-level criteria in this method are fixed and, as described in the previous section, we have our own set of criteria the BOCR method is less usable for our purposes.

The selection method we propose in this paper is based on the Analytical Network Process (ANP) method. ANP is a multi-criteria method that helps in decision-making, which is developed by Professor Thomas L. Saaty. ANP is an extension on his earlier Analytical Hierarchy Process (AHP) method (Saaty & Vargas, 1980). In figure 1 an overview is shown of ANP.

Although ANP hasn't been validated extensively in comparison to AHP (Zhao & Chen, 2004) we have decided to use it as the basis to our method because of the possibility of interdependency between elements. ANP consists of clusters and elements. Within clusters independent elements are listed (which contain criteria and sub criteria) that influence the decision-making process. As can be seen in figure 1 clusters and elements can also influence each other. For example the criteria '*Supplier references*' might be interdependent with the criteria '*Experience of the vendor and/or implementation partners'* because if there is little experience with the implementation of BPMS the number of references is limited. This is also the biggest difference in comparison to AHP. AHP is focused on organizing criteria in a hierarchical manner to determine a 'best' path to a decision based on the goals and objectives that are used as input. Criteria within the AHP method do not influence each other. ANP on the other hand is better suited in a decision-making process that is more dynamic and where cause-effect relations between criteria are defined. However it is not always necessary to define interdependencies between criteria to still be able to use this selection method.

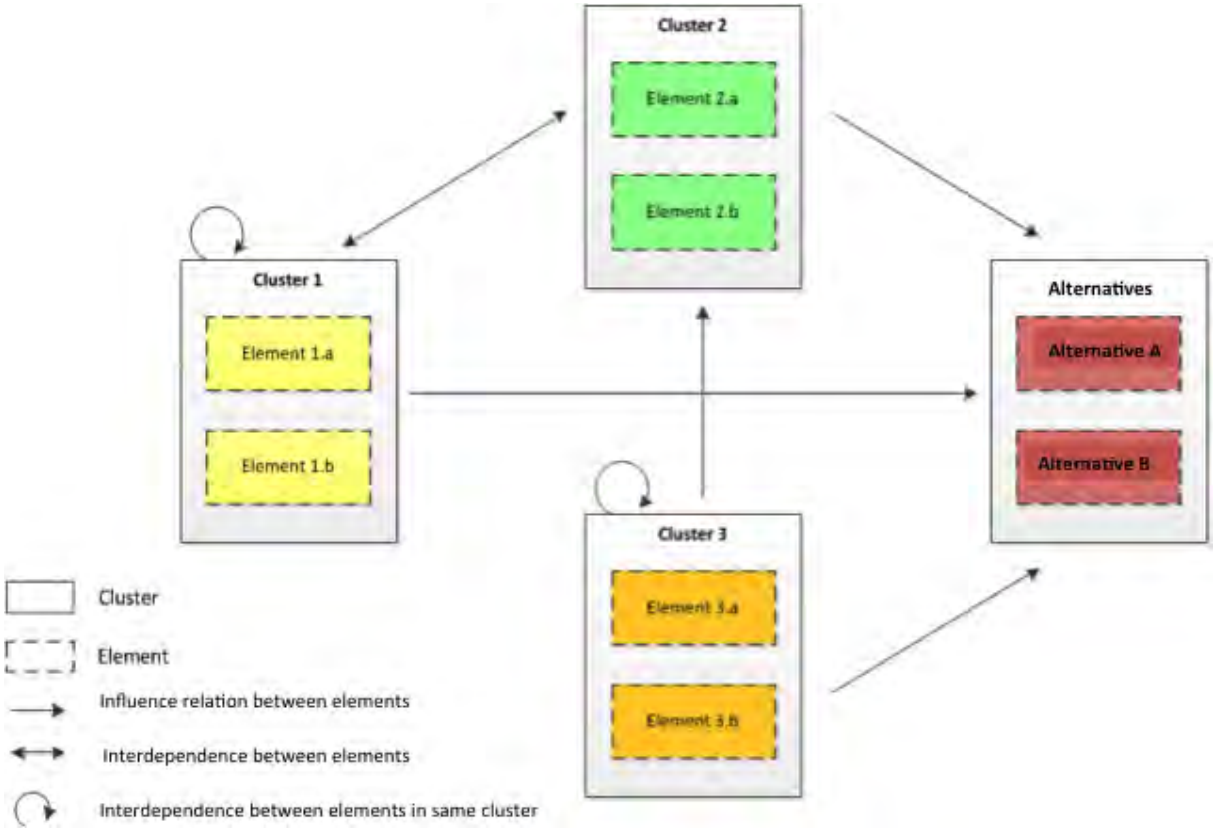

Figure 1. Schematic overview of ANP

RESULTS

The categories and criteria that we have described earlier are used in combination with ANP and together form the model that is shown in figure 2

As stated earlier the stakeholders are responsible for determining the criteria that are important in the BPMS selection process. For this you need to organize expert sessions in which the organization strategy and goals are used as an input for selecting (or defining new) criteria. Furthermore these sessions can also be used to consider if the criteria need to be weighted differently and whether there are interdependencies that need to be taken into account.

Although figure 2 does not show the interdependence or influences between criteria (which is shown in figure 1) these relations do exist. However since these differ per organization (as do the criteria that are relevant) the method needs to be customized and placed into context for each BPMS selection project. This assures that the method will fit with the goals and strategy of the organization

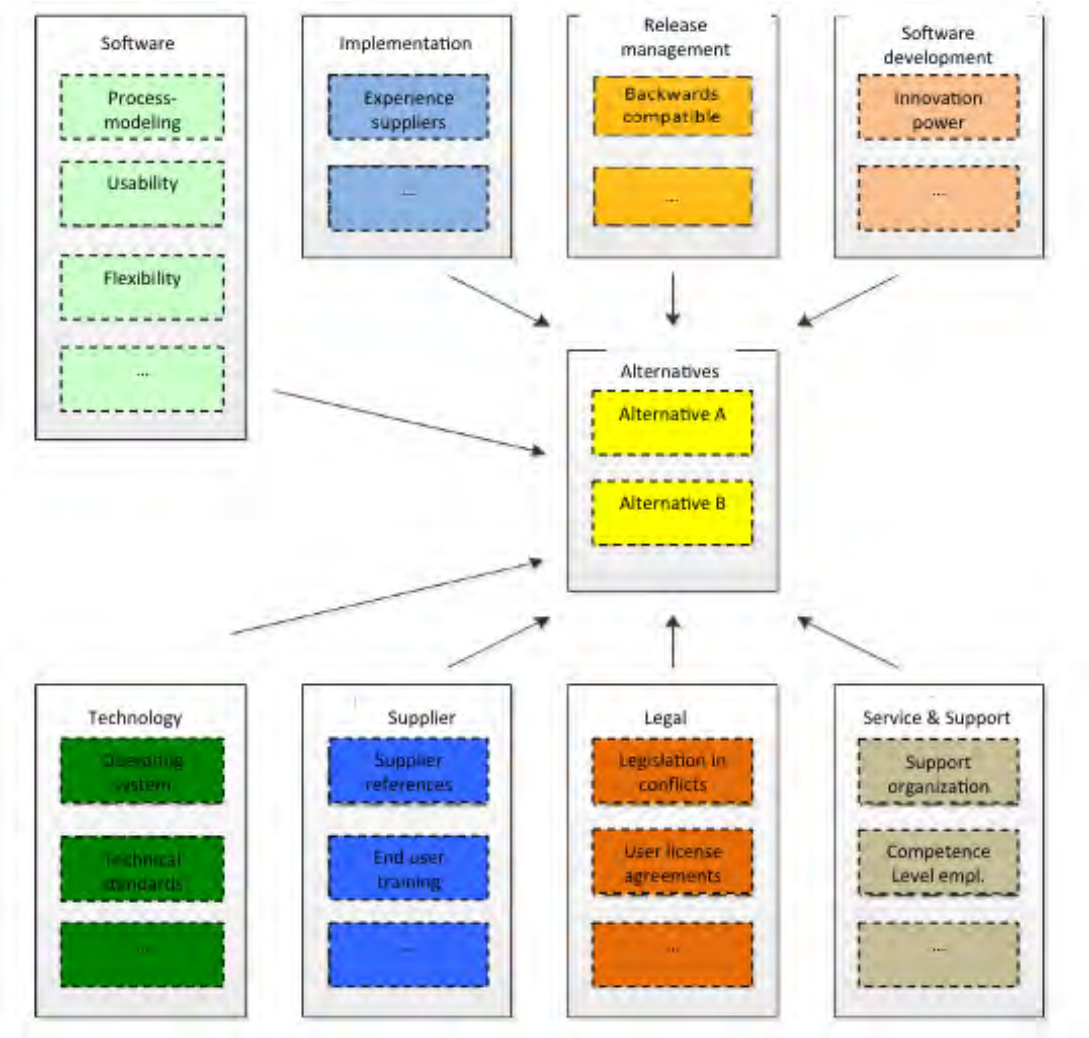

Figure 2. BPMS Selection method

CONCLUSION

In this paper we have described research into the development of a method for BPMS selection based upon a set of validated criteria. This research is relevant because in recent years business process management and business process management systems are getting more attention and while this has lead to an increase in research on BPM and BPMS it was focused on the architecture of the system and how to implement such systems, not on how to select a BPM system. For the selection process companies are still dependent on general methods for enterprise systems selection such as ERP and CRM.

The method we constructed is based on the Analytical Network Process method and combined with BPMS specific selection criteria that we found in our research. The relevance of the criteria can differ depending on the organization, its strategy and goals. The method we present in this paper has the flexibility to be adapted to the situation at hand and therefore should be ideally suited for use in practice.

LIMITATIONS AND FURTHER RESEARCH

In our research we have used different methods and techniques in order to be as objective as possible in determining the criteria that are important when selecting a BPMS. However the number of experts that are interviewed and also the number of respondents to our survey are too limited to be absolutely certain about the outcomes. In the setup of our research we wanted to include a Delphi study, however in the period that the research was performed (spring and summer of 2012) we were not able to get a panel together and plan several meetings.

Besides the limitations to the final set of criteria there can also be some discussion about the method we choose as the foundation to our BPMS selection method. The choice between the four different methods available to us was primarily made based on findings from literature and the interviews with the BPMS experts (who are not necessarily experts in the use of these methods). We didn't perform an in-depth study into the success of each method in practice or interview people that have used one or more of these methods.

There are several opportunities for further research. First of all in this research we have not done any research in how the criteria influence each other. Although the foundation to our method (ANP) takes the possibility of criteria that have an influence on other criteria into account, it is currently not clear which relationships exist between the different criteria. Empirical research can be performed to study the correlations between criteria and sub criteria; such a study can then also be used to rank the criteria in order of importance.

Another research project that makes selection of BPMS easier, would be to research the BPMS applications that are available on the market and determine which criteria these applications fulfil best. This type of research is often performed by analyst firms, for this they send surveys to the BPMS vendors. However this is not a very objective method of research and therefore we propose that universities should perform this research based on a better research approach.

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APPENDIX 1

In the table below an overview is given of all 39 high-level selection criteria for BPMS.

Category	Criteria
Supplier	Supplier References Stability Sector specific solution Partners End User Training Pricing
Software	Process modeling Process simulation functionality Process validation functionality Process design functionality Process implementation functionality Process enactment & monitoring functionality Process evaluation functionality Usability Flexibility International functionality
Technology	Infrastructure – operating system Cloud solution Programming languages used Modelling languages (e.g. XPDL, WPDL) Documentation standards used
Release management	Release cycle Update distribution process Support of old versions Backwards compatible
Service & Support	Number of support partners Support levels (structure & organization) Competence level of employees

	Sector focus
Software Development	Development capacity How is functionality prioritized Innovation power
Implementation	Number of implementation partners and/or consultants at vendor Experience of the vendor and/or implementation partners Sector knowledge Implementation method used is proven
Legal	Legislation used in conflicts Is software code open or closed source User license agreements